

# Equations (2) Expanding brackets

## continued

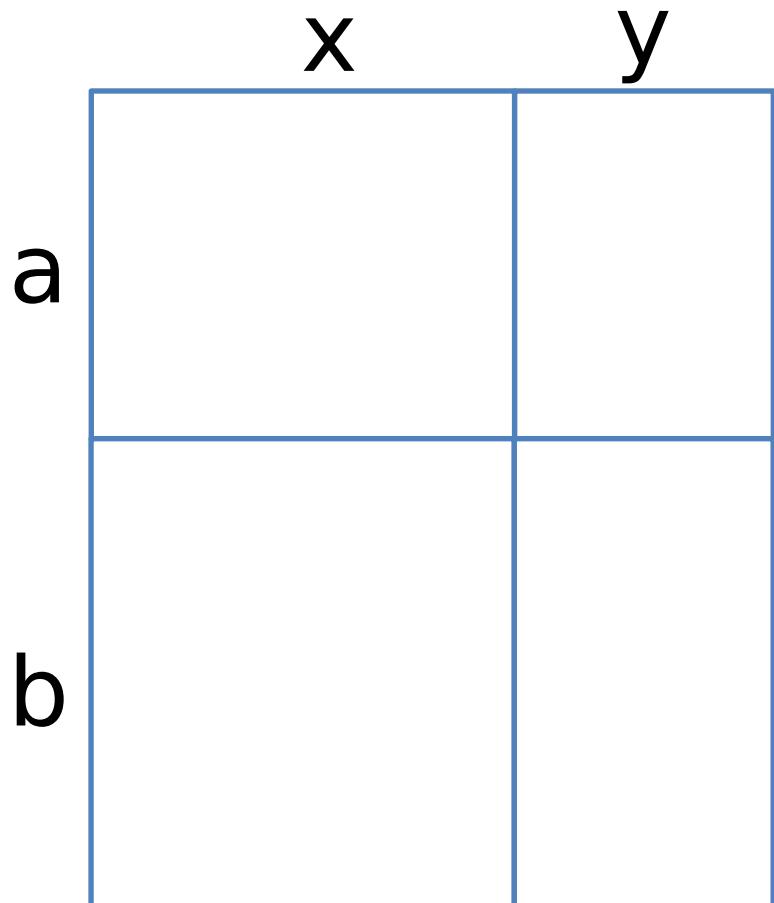
Work out the area of rectangle in two ways...

1) By using the sides of the big rectangle.

$$\text{Area} = ?$$

2) By combining the area of the four smaller rectangles.

$$\text{Area} = ?$$



# RECAP: Expanding single bracket

You already know how to expand a bracket when you have a single term in front of it...

$$x(2+y) = 2 \quad ?$$

But more generally, what would happen if we multiplied two brackets together?

$$(x+2)(x+3) = ?$$

$$(x+y+1)(x-1) = ?$$

# Expanding Brackets in General

- ! To expand out two brackets, multiply each of the things in the first bracket by each of the things in the second bracket.

$$(x+2)(y+3)$$

$$\textcolor{red}{i} xy + 3x + 2y + 6$$

Click for  
Choice 1

Click for  
Choice 2

Click for  
Choice 3

Click for  
Choice 4

Test your understanding!

$$(x+2)(x+3) = x \boxed{\quad ? \quad} = x \boxed{\quad ? \quad}$$

$$(x-1)(x+1) \boxed{\quad ? \quad} - 1 \boxed{\quad ? \quad}$$

$$(2x-1)(x+2) = \boxed{\quad ? \quad} - 2 = \boxed{\quad ? \quad}$$

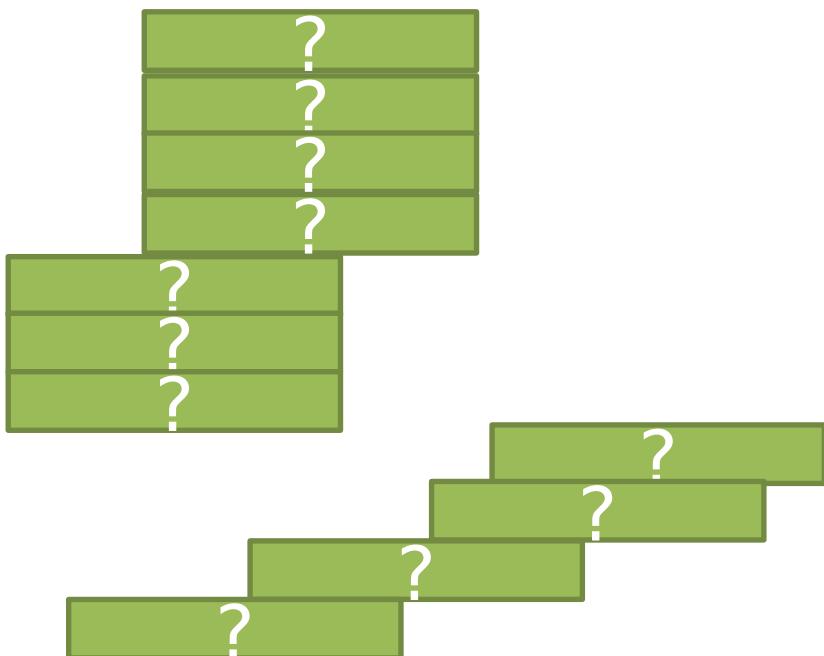
$$(2x-2)(y+ \boxed{\quad ? \quad}) x - 2y - 12$$

$$(x+3)^2 = (x \boxed{\quad ? \quad}) \rightarrow \boxed{\quad ? \quad}$$

$$(x-2)^2 = (x \boxed{\quad ? \quad}) \rightarrow \boxed{\quad ? \quad}$$

# Exercise 1

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11

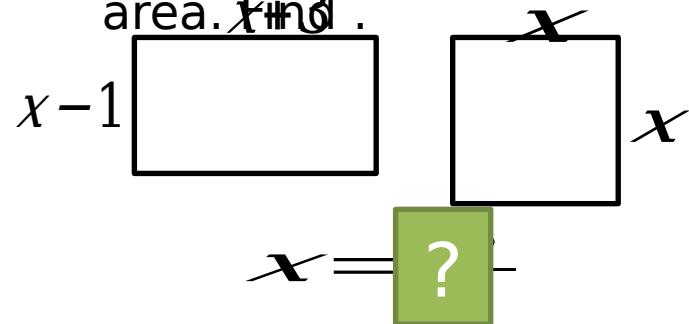


Solve the following: (by first expanding both sides of the equation)

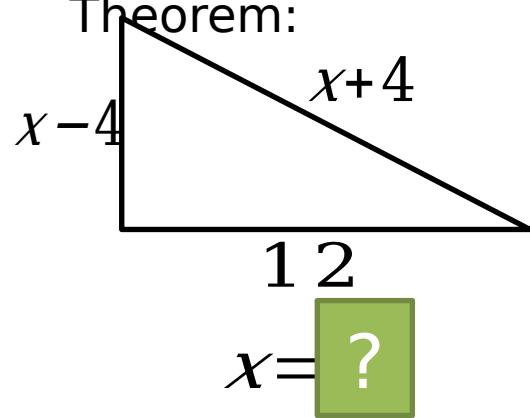
12  
13  
14



15 The rectangle and the square have the same area. ~~Find~~ .



N Determine using Pythagoras Theorem:





## Superpower Skill #1:

# Expanding square brackets quickly

Notice that .

?

Therefore, when we have two terms in a bracket, and the bracket is squared, we can expand more quickly without having to collect terms:

	Expression	1 <sup>st</sup> Term Squared	2 x 1 <sup>st</sup> Term x 2 <sup>nd</sup> Term	2 <sup>nd</sup> Term Squared
1	$(x+3)^2 = ?$	$x^2$	$+6x$	$+9$
2	$(x-5)^2 = ?$	?	?	?
3	$(x-8)^2 = ?$	?	?	?
4	$(2x+1)^2 = ?$	?	?	?
5	$(3x-2)^2 = ?$	?	?	?



## Superpower Skill #2:

# Being careful with negatives

You need to be really careful when subtracting an expression you are about to expand.

Expand  $1 - (x + 3)(x - 4)$

$$\begin{aligned} &= ? \\ &1 ? \\ &= ? \\ &12 \\ &= 13 - x^2 + x \end{aligned}$$

**Bro Tip:** Put the expanded expression in a bracket before you subtract it. This helps you avoid .

Had we not used brackets in the line above, we might have (wrongly) thought this term was negative.

# Test Your Understanding

Expand the following.

1  $x - (x + 4)(x - 1)$

=

=

=

?

2  $x^2 - (2x - 1)^2$

=

=

=

?

1)

1



## Superpower Skill #3:

# Expanding brackets with more than 2 items

When there's more than two items in each bracket, we still use the same rule to expand: Times each thing in the first bracket by each thing in the second bracket...

$$(x + 3)(x^2 + x - 2)$$

$$\begin{aligned} &= \boxed{\quad ? \quad} & 3x - 6 \\ &= \boxed{\quad} \end{aligned}$$

# Starter

Expand the following.

1 
$$(x + y)(x + y + 1)$$
  
= ? +  $y^2 + y$   
= ? +  $y$

2 
$$(x^2 + 3)(x^2 + x + 1)$$
  
= ? +  $3x +$   
3 ?  
$$= x^4 + x^3 + 4x^2 + 3x + 3$$

# Exercise 2

1

Expand the following  
WITHOUT working.

a  $(x + 1)^2$  ?  $x + 1$

b  $(x - 3)^2$  ?  $+ 9$

c  $(x + 4)^2$  ?  $x + 16$

d  $(x - 5)^2$  ?  $x + 25$

e  $(3x + 1)^2$  ?  $6x + 1$

f  $(4x - 3)^2$  ?  $4x + 9$

g  $(10x + 3)^2$  ?  $60x$

h  $+ 9$  ?  
 $(x - y)^2 = x^2 - 2xy + y^2$

2

Expand the following.

a  $1 - x(x - 1)$  ?  $+ x$

b  $2 - (x + 1)(x + 3)$  ?  $3x$

c  $x - (x - 2)(x - 5)$  ?  $5x - 6$

d  $2x - (x - 3)$  ?  $x - 9$

e  $(2x + 1)^2 - (2x - 1)^2$  ?

f  $(3x + 3)(x - 1) - (2x - 3)(x + 1)$  ?  
 $= x^2 - x + 3$

3

Expand the following

a  $(x + 2)(x^2 + 2x + 1)$  ?

b  $+ 5x + 2$  ?

c  $(2x + 1)(3x^2 - 4x + 1)$  ?

d  $5x^2 + 2$  ?

e  $(y^2 - y + 1)(y^2 - 3y + 1)$  ?

N  $(a - 1)(a^2 + a + 1) = a^3 - 1$

$(x^2 + x + 1)^2 = x^4 + 2x^3 + 3x^2 + 2x + 1$  ?

Expand ?  
(Hint: it might be easier to do one term at a time) ?

$(x + 1)^0 = 1$  ?

$(x + 1)^1 = x + 1$  ?

$(x + 1)^2 = x^2 + 2x + 1$  ?

$(x + 1)^3 = x^3 + 3x^2 + 3x + 1$  ?

$(x + 1)^4 = x^4 + 4x^3 + 6x^2 + 4x + 1$  ?

$(x + 1)^5 = x^5 + 5x^4 + 10x^3 + 10x^2 + 5x + 1$  ?